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25 February 1963

MEMORANDUM FOR: Acting Chief, Development Branch 26 Feb 63

SUBJECT : Justification for Increasing the Maximum Resolution Capability of the [redacted] Change Detector from 20 lines/mm to 50 lines/mm

4. Discussion:

25X1A a. [redacted] and the writer both indicated to [redacted] personnel that the resolution of the Change Detector (20 lines/mm) was so low as to seriously limit its usefullness. This resulted in an investigation [redacted] to determine the feasibility of increasing the resolution and how much. Studies were also made in the areas of: cathode ray tube, power supply regulation and ripple requirements, dynamic focus requirements, optical focus requirements and registration accuracy.

25X1A b. On 29 January 1963 [redacted] submitted to GIMRADA, ~~Intelligence Division, Ft. Belvoir~~, Virginia [redacted] a letter report in which it is shown feasible to increase the resolution of the Change Detector to 50 optical line pairs per millimeter. It is further shown that the objectional ~~CRT~~ raster lines appearing in the present design can be eliminated by introducing a "spot wobble" or raster line suppression. ~~The estimated cost of these~~ improvements would be in the order of [redacted]

c. The current design of the Change Detector provides a 70mm frame scan at 6 to 7 lines/mm for change detection. This image is displayed on two 14 inch TV screens one of which will show the unaltered scene the other will exhibit the changes that have occured, provided they can be resolved at 6 lines/mm. Should they be too small to be resolved, a switch is made to 20 lines/mm and a reduced area is displayed at 40X magnification.

25X1A d. This is the design objective that was approved by this Agency 15 June 1962 and funded in the amount of [redacted] The action was based on two assumptions: One, the experience gained in the development and evaluation of this Change Detector will provide the first actual experience in automatic change detection and will be of great value in considering further projects in the field of automatic photointerpretation aids. Two, the automatic correlation technique which is part of the Change Detector will provide knowledge and experience in automatic correlation which can be applied to other interpretation devices, which will surely have to be developed. To the best of my knowledge this is the first time any company has attempted building a device that will correlate automatically with four degrees of freedom. Three, if some degree of success can be obtained in automatic change detection it will release the time and effort of the interpreter being spent on scanning great quantities of film for changes, and let him devote his effort to studying the indicated changes.

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e. In the proposed change the interpreter would still view the gross imagery at 6 lines per mm for change detection. On the one display he could apply all the normal interpreter techniques used in viewing on a light table, ignoring those changes which he could immediately recognize as other than man made. On the other display he would have the capability of displaying changes occuring in a .3" x .4" area on the film at 50 lines per mm. Although this is a long way from the film resolutions expected to be available in the near future, it is in the right direction, as higher resolution readouts by electronic means will be required for many image analysis devices in the immediate future.

f. The current spot size of the cathod ray tube is 0.001 inches. To obtain 50 lines per mm the spot size must be reduced to 0.0006 inches, this has already been accomplished in development type tubes. Other components that will require refinements are: regulation of the high voltage power supply, focus and control of the spot size over the entire face of the crt, more accurate placement of optics and greater rigidity in the mechanical supporting elements, and better quality optics particularly as to flatness of optical surfaces. All of these refinements, although not absolutely required in the present design, would if embodied, produce a more reliable and useful piece of equipment.

7. Conclusions.

a. It is possible to increase the readout resolution of the Change Detector by a factor of 2.5 to 1.

b. The change will not effect the gross presentation of the instrument.

c. The change will not degrade the reliability of the instrument, but should in fact increase its reliability.

d. It will be possible to inspect any portion of the 70mm frame at the 50 line/mm resolution, if desired.

e. The increased resolution will save time of the interpreter since he will be able to make analysis of suspected areas on the instrument, (not requiring removal of the film for use on more powerfull viewing devices to be certain of its content.)

f. The interpreter will be able to use shadow and cloud rejection techniques to eliminate noise when he is satisfied that the interested changes will not be clipped along with the unwanted signals.

g. The improved machine will provide greater accuracy in the total number of changes detected. In fact it will show all changes falling within the 50 line/mm resolution limits of the instrument.

h. The USArmy will be able to use the improved instrument to obtain information on the total number of changes that appear in nature from day to day and over longer periods.

i. An unsolicited proposal spelling out the exact work and itimized costs of the proposed contract change will be required before proposed contract modification can be forwarded to Administrative Staff for action. This proposal will be forthcoming through GIMRADA immediately upon approval of the proposed change by the Technical Development Committee.

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h. The additional cost of [redacted] contract is a very modest amount to obtain an improvement in the order of 2.5 to 1.

8. Recommendations:

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a. It is recommended that the proposed development change in the Change Detector now under development [redacted] to increase the readout from 20 lines per millimeter to 50 lines per millimeter, be presented to the Technical Development Committee for consideration.

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b. It is further recommended that a contract modification in the amount of approximately [redacted] be approved to accomplish this modification and that if necessary the contract completion date of 15 March 1964 be extended by the required amount.

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[redacted]
Development Branch, P&DS

1 Mar 65

MEMORANDUM FOR: [redacted]

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John, as this document indicates [redacted] is in favor of incorporating higher resolution in the prototype instrument to be fabricated. It will certainly cost less to incorporate this feature now than later. However I have reasonable doubts as to the usefulness of the instrument in either mode, and therefore have reservations about supporting the additional funding.

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(DATE)

FORM NO. 101 REPLACES FORM 10-101
1 AUG 54 WHICH MAY BE USED.

(47)

24 April 1963

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A contract modification is being negotiated to increase the viewing resolution from the existing 20 l/mm to 50 l/mm. This amendment, when consumated, will change the date for delivery of prototype by about two months extending the scheduled March 1964 delivery to May 1964.

The current contract is about 30 days behind schedule in the areas of shadow rejection circuitry and in the optical/mechanical design. With the above modification embodied in the development rescheduling will absorbe this modest delay.